



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION II  
SAM NUNN ATLANTA FEDERAL CENTER  
61 FORSYTH STREET, SW, SUITE 23T85  
ATLANTA, GEORGIA 30303-8931

July 27, 2006

South Carolina Electric & Gas Company  
ATTN: Mr. Jeffrey B. Archie  
Vice President, Nuclear Operations  
Virgil C. Summer Nuclear Station  
P. O. Box 88  
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION - NRC INTEGRATED INSPECTION  
REPORT 05000395/2006003

Dear Mr. Archie:

On July 1, 2006, the United States Nuclear Regulatory Commission (NRC) completed an inspection at your Virgil C. Summer Nuclear Station. The enclosed integrated inspection report documents the inspection results, which were discussed on July 11, 2006, with Mr. Thomas Gatlin and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, one NRC-identified finding of very low safety significance was identified. This finding was determined to involve a violation of NRC requirements. However, because of its very low safety significance and because it was entered into your corrective action program, the NRC is treating this finding as a non-cited violation (NCV) consistent with Section VI.A of the NRC Enforcement Policy. In addition, one licensee-identified violation, which was determined to be of very low safety significance, is listed in Section 4OA7 of this report. If you contest any NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the United States Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Virgil C. Summer Nuclear Station.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

**/RA/**

Kerry D. Landis, Chief  
Reactor Projects Branch 5  
Division of Reactor Projects

Docket No.: 50-395  
License No.: NPF-12

Enclosure: NRC Integrated Inspection Report 05000395/2006003  
w/Attachment: Supplemental Information

cc w/encl: (See page 2)

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

**/RA/**

Kerry D. Landis, Chief  
Reactor Projects Branch 5  
Division of Reactor Projects

Docket No.: 50-395  
License No.: NPF-12

Enclosure: NRC Integrated Inspection Report 05000395/2006003  
w/Attachment: Supplemental Information

cc w/encl: (See page 2)

☐ PUBLICLY AVAILABLE      ☐ NON-PUBLICLY AVAILABLE      ☐ SENSITIVE      ☐ NON-SENSITIVE

ADAMS: ☐ Yes      ACCESSION NUMBER: \_\_\_\_\_

OFFICE	RII:DRP	RII:DRP	RII:DRP	RII:DRP			
SIGNATURE	JXZ per phone	LXC per phone	TLH4 for	LXG			
NAME	JZeiler	MCain	RTaylor	LGarner			
DATE	07/27/2006	07/27/2006	07/27/2006	07/27/2006			
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICIAL RECORD COPY

DOCUMENT NAME: E:\Filenet\ML062080420.wpd

cc w/encl:

R. J. White

Nuclear Coordinator (Mail Code 802)

S.C. Public Service Authority

Virgil C. Summer Nuclear Station

Electronic Mail Distribution

Kathryn M. Sutton, Esq.

Morgan, Lewis & Bockius LLP

Electronic Mail Distribution

Henry J. Porter, Director

Div. of Radioactive Waste Mgmt.

Dept. of Health and Environmental

Control

Electronic Mail Distribution

R. Mike Gandy

Division of Radioactive Waste Mgmt.

S. C. Department of Health and

Environmental Control

Electronic Mail Distribution

Robert G. Sweet, Manager

Nuclear Licensing (Mail Code 830)

South Carolina Electric & Gas Company

Virgil C. Summer Nuclear Station

Electronic Mail Distribution

Robert M. Fowlkes, General Manager

Engineering Services

South Carolina Electric & Gas Company

Virgil C. Summer Nuclear Station

Electronic Mail Distribution

Thomas D. Gatlin, General Manager

Nuclear Plant Operations (Mail Code 303)

South Carolina Electric & Gas Company

Virgil C. Summer Nuclear Station

Electronic Mail Distribution

David A. Lavigne, General Manager

Organization Development

South Carolina Electric & Gas Company

Virgil C. Summer Nuclear Station

Electronic Mail Distribution

Distribution w/encl: (See page 4)

SCE&G

4

Report to J.B. Archie from Kerry D. Landis dated July 27, 2006

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION - NRC INTEGRATED INSPECTION  
REPORT 05000395/2006003

Distribution w/encl:

R. Martin, NRR

L. Slack, RII EICS

RIDSNRRDIPMLIPB

PUBLIC

U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 50-395

License No.: NPF-12

Report No.: 05000395/2006003

Licensee: South Carolina Electric & Gas (SCE&G) Company

Facility: Virgil C. Summer Nuclear Station

Location: P. O. Box 88  
Jenkinsville, SC 29065

Dates: April 1, 2006 - July 1, 2006

Inspectors: J. Zeiler, Senior Resident Inspector  
M. Cain, Resident Inspector  
R. Taylor, Reactor Inspector, RII (Section 4OA5.1)

Approved by: K. D. Landis, Chief  
Reactor Projects Branch 5  
Division of Reactor Projects

Enclosure

## SUMMARY OF FINDINGS

IR 05000395/2006003; 04/01/2006 - 07/01/2006; Virgil C. Summer Nuclear Station; Identification and Resolution of Problems.

The report covered a three-month period of inspection by resident inspectors and one announced inspection by a regional inspector. One Green NRC-identified non-cited violation (NCV) was identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

### A. NRC-Identified and Self-Revealing Findings

#### Cornerstone: Mitigating Systems

- Green. The inspectors identified a non-cited violation of 10 CFR 50 Appendix B Criterion XVI was identified for the licensee's failure to take adequate and timely corrective actions to preclude repetition of a significant condition adverse to quality. Specifically, the licensee failed to prevent the spurious tripping of safety-related molded case circuit breakers for the Emergency Diesel Generator (EDG) room ventilation supply fans due to asymmetrical in-rush current. The licensee has entered this issue in its corrective action program for resolution.

This finding is more than minor because it is associated with the Mitigating Systems Cornerstone attribute of equipment performance and adversely affected the cornerstone objective of ensuring the availability, reliability and capability of the EDGs. The finding is of very low safety significance because it did not result in a loss of safety function of one or more EDG trains and was not potentially risk-significant due to possible external events. The direct cause of this finding involved the cross-cutting area of Problem Identification and Resolution, in that, the identified corrective actions were not adequate to resolve the fans tripping due to asymmetrical in-rush current (Section 4OA2.2).

### B. Licensee-Identified Violations

One violation of very low safety significance, which was identified by the licensee, has been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. This violation and the associated corrective action tracking number is listed in Section 4OA7 of this report.

Enclosure

## REPORT DETAILS

### Summary of Plant Status

The unit began the inspection period at 100 percent rated thermal power (RTP). On May 26, power was reduced to 75 percent to replace a leaking inboard bearing seal on the "C" feedwater booster pump. The unit was returned to 100 percent RTP on May 29. On June 16, power was reduced to 85 percent to replace a leaking inboard bearing seal on the "C" feedwater booster pump. The unit was returned to 100 percent RTP on June 19 and remained at or near full power for the remainder of the inspection period.

## 1. REACTOR SAFETY

### **Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity**

#### 1R01 Adverse Weather Protection

##### .1 Seasonal Weather Susceptibilities

###### a. Inspection Scope

The inspectors performed one adverse weather inspection for readiness of extreme hot weather. The inspectors evaluated the licensee's implementation of Operations Administrative Procedure (OAP)-109.1, "Guidelines for Severe Weather," for placing the service water pumphouse building's heating, ventilation and air conditioning (HVAC) cooling coils into service, and operator monitoring of large motor stator temperatures. The inspectors reviewed the licensee's corrective action program (CAP) database to verify that high temperature weather related problems were being identified at the appropriate level, entered into the CAP, and appropriately resolved.

###### b. Findings

No findings of significance were identified.

##### .2 Unexpected Weather Conditions

###### a. Inspection Scope

The inspectors evaluated the licensee's response to an emergent adverse weather condition involving the April 26, Tornado Warning declared for the surrounding county with the potential to affect the Virgil C. Summer Nuclear Station. The inspectors monitored the licensee's overall response and implementation of adverse weather procedure OAP-109.1, "Guidelines for Severe Weather."

###### b. Findings

No findings of significance were identified.

Enclosure





## 1R04 Equipment Alignment

### .1 Partial System Walkdowns

#### a. Inspection Scope

The inspectors conducted three partial equipment alignment walkdowns (listed below) to evaluate the operability of selected redundant trains or backup systems with the other train or system inoperable or out-of-service (OOS). Correct alignment and operating conditions were determined from the applicable portions of drawings, system operating procedures (SOPs), Final Safety Analysis Report (FSAR), and technical specifications (TS). The inspections included review of outstanding maintenance work requests (MWRs) and related Condition Evaluation Reports (CERs) to verify that the licensee had properly identified and resolved equipment alignment problems that could impact mitigating system availability. Documents reviewed are listed in the Attachment.

- “A” emergency diesel generator (EDG) while the “B” EDG was OOS during scheduled maintenance for intercooler performance troubleshooting;
- “A” service water (SW) and service water booster pump (SWBP) while the “B” SW/SWBP was OOS for scheduled maintenance; and,
- “A” reactor building (RB) spray pump while the “B” RB spray pump was OOS for scheduled maintenance.

#### b. Findings

No findings of significance were identified.

### .2 Complete System Walkdown

#### a. Inspection Scope

The inspectors performed a detailed review and walkdown of the SWBPs and related piping system to identify any discrepancies between the current operating system equipment lineup and the designed lineup. This walkdown included accessible areas outside the containment. In addition, the inspectors reviewed completed surveillance procedures, outstanding MWRs, system health reports, and SWBP related CERs to verify that the licensee had properly identified and resolved equipment problems that could affect the availability and operability of the system. Documents reviewed are listed in the Attachment.

#### b. Findings

No findings of significance were identified.

## 1R05 Fire Protection

### a. Inspection Scope

The inspectors reviewed recent CERs, MWRs, and impairments associated with the fire suppression system. The inspectors reviewed surveillance activities to determine whether they supported the operability and availability of the fire protection system. The inspectors assessed the material condition of the active and passive fire protection systems and features and observed the control of transient combustibles and ignition sources. The inspectors conducted routine inspections of the following nine areas (respective fire zones also noted):

- “A” and “B” EDG rooms (fire zones DG-1.1/1.2 and DG-2.1/2.2);
- “A” and “B” HVAC chilled water pump rooms (fire zones IB-7.2, IB-9, IB-23.1);
- “A” and “B” component cooling water pumps/heat exchangers and service water booster pump room (fire zones IB-25.1.1, IB-1.2, IB-1.3, and IB-1.5);
- Turbine driven emergency feedwater pump (TDEFW) room (fire zone IB-25.2);
- SW pumphouse (fire zones SWPH-1, SWPH-3, and SWPH-5.1/5.2);
- Relay room solid state protection system instrumentation and inverter (fire zones CB-6, CB-10, CB-12);
- 1DB switchgear rooms and HVAC rooms (fire zones IB-16, IB-17, IB-22.2);
- “A” and “B” battery and charger rooms (fire zones IB-2, 3, 4, 5, and 6); and,
- Auxiliary building AB-374' elevation (residual heat removal and RB spray pumps) (fire zone AB-1.0).

### b. Findings

No findings of significance were identified.

## 1R06 Flood Protection Measures

### a. Inspection Scope

The inspectors reviewed and walked down two areas (i.e., service water pumphouse and auxiliary building AB-374' elevation) regarding internal flood protection features and equipment to determine consistency with design requirements, FSAR, and flood analysis documents. Risk significant structures, systems, and components in these areas included the service water pumps and related switchgear, residual heat removal (RHR), and RB spray pumps. The inspectors reviewed the licensee's CAP database to verify that internal flood protection problems were being identified at the appropriate level, entered into the CAP, and appropriately resolved.

### b. Findings

No findings of significance were identified.

## 1R07 Heat Sink Performance

### Annual Review

#### a. Inspection Scope

On April 10, the inspectors observed heat exchanger testing for the "B" EDG intercooler. The inspectors specifically examined, by direct inspection, the performance of the service water system heat exchanger performance test associated with the "B" EDG intercooler heat exchanger. The inspectors also reviewed the test results and subsequent evaluation by the licensee. The review verified that heat exchanger performance problems were adequately identified and entered into the licensee's CAP and that the frequency of testing was sufficient and established acceptance criteria were appropriate to detect any potential deficiencies. Trending analysis, test frequency, and future testing plans for the EDG heat exchangers were discussed with the system engineer responsible for monitoring heat exchanger performance. Documents reviewed are listed in the Attachment.

#### b. Findings

No findings of significance were identified.

## 1R11 Licensed Operator Requalification Program

#### a. Inspection Scope

On June 21, the inspectors observed performance of senior reactor operators and reactor operators on the plant simulator during licensed operator requalification training. The training scenario (LOR-ST-010) involved a dropped rod combined with a continuous rod withdrawal event at 25 percent power, middle-of-life. The inspectors verified that training included risk-significant operator actions and implementation of emergency classification and the emergency plan. The inspectors assessed overall crew performance, communications, oversight of supervision, and the evaluators' critique. The inspectors verified that any training issues were appropriately captured in the licensee's CAP.

#### b. Findings

No findings of significance were identified.

## 1R12 Maintenance Effectiveness

#### a. Inspection Scope

The inspectors evaluated two equipment issues described in the CERs listed below to verify the licensee's effectiveness of the corresponding preventive or corrective maintenance associated with structures, systems or components (SSCs). The

Enclosure

inspectors reviewed maintenance rule (MR) implementation to verify that component and equipment failures were identified, entered, and scoped within the MR program. Selected SSCs were reviewed to verify proper categorization and classification in accordance with 10 CFR 50.65. The inspectors examined (a)(1) corrective action plans to determine if the licensee was identifying issues related to the MR at an appropriate threshold and that corrective actions were established and effective. The inspectors' review also evaluated if maintenance preventable functional failures (MPFF) or other MR findings existed that the licensee had not identified. The inspectors reviewed the licensee's controlling procedures, i.e., engineering services procedure (ES)-514, "Maintenance Rule Implementation," and the Virgil C. Summer "Important To Maintenance Rule System Function and Performance Criteria Analysis" to verify consistency with the MR requirements.

- CER 0-C-06-0537, jumpered thermal overload found in "B" boric acid transfer pump breaker; and,
- CER 0-C-06-1449, "A" EDG room cooling fan, XFN0075B, tripped.

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

The inspectors reviewed the licensee's assessments of the risk impacts of removing from service those components associated with planned and emergent work items. The inspectors evaluated the five selected work activities listed below for: (1) the effectiveness of the risk assessments performed before maintenance activities were conducted; (2) the management of risk; (3) that, upon identification of an unforeseen situation, necessary steps were taken to plan and control the resulting emergent work activities; and (4) that emergent work problems were adequately identified and resolved. The inspectors evaluated the licensee's work prioritization and risk characterization to determine, as appropriate, whether necessary steps were properly planned, controlled, and executed for the planned and emergent work activities listed below:

- Work Week 2006-14, risk assessment for troubleshooting excessive turbine inboard bearing oil leakage from the TDEFW and investigation of "B" EDG reduced intercooler heat exchanger performance;
- Work Week 2006-16, risk assessment for "B" EDG intercooler and lube oil cooler thermostatic control valve inspections with "B" EDG and "C" circulating water pump OOS;
- Work Week 2006-17, risk assessment for emergent maintenance due to unexpected "B" EDG trip on high crankcase pressure during surveillance testing;
- Work Week 2006-18, risk assessment for scheduled switchyard work, "B" SW/SWBP OOS for scheduled maintenance, "B" motor driven emergency

Enclosure

- feedwater pump OOS for scheduled testing, and “B” RB spray pump OOS for scheduled maintenance; and,
- Work Week 2006-19, risk assessment for “A” EDG OOS for scheduled maintenance, “C” SW pump OOS for scheduled motor rewind and traveling screen replacement, and “C” circulating water pump OOS.

b. Findings

No findings of significance were identified.

1R14 Operator Performance During Non-Routine Evolutions and Events

a. Inspection Scope

The inspectors evaluated operator initial response and recovery actions for the listed non-routine event to ensure they were appropriate and in accordance with required alarm response, abnormal and emergency procedures. The inspectors also evaluated performance and equipment problems to ensure that they were entered into the CAP.

- May 6, unexpected de-energization of “A” Train alternating current (AC) 7200 volt emergency bus 1EA and entry into 8-hour limiting condition for operation action statement of TS 3.8.3.1 (CER 0-C-06-1537).

b. Findings

No findings of significance were identified

1R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed five operability evaluations affecting risk significant mitigating systems to assess, as appropriate: (1) the technical adequacy of the evaluations; (2) whether operability was properly justified and the subject component or system remained available, such that no unrecognized increase in risk occurred; (3) whether other existing degraded conditions were considered; (4) where compensatory measures were involved, whether the compensatory measures were in place, would work as intended, and were appropriately controlled; and (5) the impact on TS limiting conditions for operations and the risk significance in accordance with the Significance Determination Process (SDP). Also, the inspectors verified that the operability evaluations were performed in accordance with station administrative procedure (SAP)-999, “Corrective Action Program.”

- CER 0-C-06-1091, “B” EDG intercooler heat exchanger (XHE0017B-HE3) does not meet the design basis limiting condition of ES-560.211, “SW Heat Exchanger Performance;”

- CER 0-C-06-1135, 7300 process instrumentation and control system circuit breakers found to be 35 amps versus recommended 30 amps;
- CER 0-C-06-1252, hot spots identified during thermography of pressurizer backup heater power panel;
- CER 0-C-06-1500, foreign substance found on post-accident monitoring instrumentation isolation circuit boards; and,
- CER 0-C-06-1974, "B" component cooling water heat exchanger degraded heat transfer capability.

b. Findings

No findings of significance were identified.

1R19 Post-Maintenance Testing

a. Inspection Scope

For the six maintenance activities listed below, the inspectors reviewed the associated post-maintenance testing (PMT) procedures and witnessed either the testing and/or reviewed test records to assess whether: (1) the effect of testing on the plant had been adequately addressed by control room and/or engineering personnel; (2) testing was adequate for the maintenance performed; (3) test acceptance criteria were clear and adequately demonstrated operational readiness consistent with design and licensing basis documents; (4) test instrumentation had current calibrations, range, and accuracy consistent with the application; (5) tests were performed as written with applicable prerequisites satisfied; (6) jumpers installed or leads lifted were properly controlled; (7) test equipment was removed following testing; and (8) equipment was returned to the status required to perform its safety function. The inspectors verified that these activities were performed in accordance with general test procedure (GTP)-214, "Post Maintenance Testing Guideline."

- PMT for investigating excessive turbine inboard bearing oil leakage on TDEFW pump (MWR 0603864);
- PMT for "B" EDG following inspections of intercooler heat exchanger and repair of associated thermostatic control valve (MWRs 0604121 and 0604130);
- PMT for "B" EDG following emergent repair from high crankcase pressure trip (MWR 0605499);
- PMT for "B" RB spray pump following scheduled preventive maintenance (MWRs 0522148 and 0526652);
- PMT for emergent replacement of failed isolator circuit board in the Bypass Inoperable Status Indication (BISI) system resulting in de-energization of 7200 volt safety-related electrical bus (MWR 0605610); and,
- PMT for "C" SW pump following motor and traveling screen replacement (MWR 0601586).

b. Findings

No findings of significance were identified.

1R22 Surveillance Testinga. Inspection Scope

The inspectors observed and/or reviewed the five surveillance tests listed below to verify that TS surveillance requirements were followed and that test acceptance criteria were properly specified to ensure that the equipment could perform its intended safety function. The inspectors verified that proper test conditions were established as specified in the procedures, that no equipment preconditioning activities occurred, and that acceptance criteria had been met.

In-Service Tests:

- STP-225.001A, "Diesel Generator B Support System Pump and Valve Test (Group B)"

Reactor Coolant System Leakage Tests:

- STP-114.002, "Operational Leakage Test"

Other Surveillance Tests:

- STP-125.013B, "Diesel Generator B Semiannual Operability Test;"
- STP-2005.003, "Charging / Safety Injection Pump and Valve Test" (for "C" pump); and,
- STP-105.006, "Safety Injection / Residual Heat Removal Monthly Flow Path Verification Test."

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modificationsa. Inspection Scope

The inspectors reviewed the following equipment change that was considered a temporary modification. The inspectors evaluated the change documents and the associated 10 CFR 50.59 screening against the system design basis documentation and FSAR to verify that the change did not adversely affect the safety function of important safety systems. In addition, the inspectors verified that the changes were developed and implemented in accordance with licensee procedure SAP-148, "Temporary Bypass, Jumper, and Lifted Lead Control."

Enclosure



- Bypass Authorization Request (BAR) 06-03, isolation of BISI indication for “C” component cooling water pump status due to failed circuit board (CER 0-C-06-1440).

b. Findings

No findings of significance were identified.

## **Cornerstone: Emergency Preparedness**

### 1EP6 Drill Evaluation

a. Inspection Scope

On May 24, 2006, the inspectors reviewed and observed the performance of an Emergency Planning Drill that involved a simulated station loss of offsite and onsite electrical AC power followed by a reactor coolant pump seal loss-of-coolant accident and total loss of emergency feedwater makeup (EPP-06-02B, “Emergency Planning Drill,” Revision 0). The inspectors assessed emergency procedure usage, emergency plan classification, notifications and the licensee’s identification and entrance of drill problems into their CAP. This inspection evaluated the adequacy of the licensee’s conduct of the drill and critique performance. Drill issues were captured by the licensee in CERs 0-C-06-1838 through 0-C-06-1843 and were reviewed by the inspectors.

b. Findings

No findings of significance were identified.

## **4. OTHER ACTIVITIES**

### 4OA2 Identification and Resolution of Problems

#### .1 Daily Screening of Corrective Action Items

a. Inspection Scope

As required by Inspection Procedure 71152, “Identification and Resolution of Problems,” and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee’s corrective action program. This review was accomplished by either attending daily screening meetings that briefly discussed major CERs, or accessing the licensee’s computerized corrective action database and reviewing each CER that was initiated.

b. Findings

No findings of significance were identified.

Enclosure

## .2 Annual Sample Review

### a. Inspection Scope

The inspectors reviewed one issue in detail to evaluate the effectiveness of the licensee's corrective actions for important safety issues documented in CER 0-C-99-0084, CER 0-C-04-1799 and CER 0-C-06-1449. These CERs were associated with licensee efforts to address spurious tripping of safety-related molded case circuit breakers due to "asymmetrical" in-rush currents. The inspectors assessed whether the licensee adequately addressed all of the applicable causal factors and identified effective corrective actions. Also, the inspectors verified the issue was processed in accordance with SAP-999, "Corrective Action Program."

### b. Findings

Introduction. A Green NRC-identified non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," was identified for the failure to take adequate and timely corrective actions to preclude repetition of a significant condition adverse to quality to prevent the spurious tripping of safety-related molded case circuit breakers due to asymmetrical in-rush current.

Description. In July 1992, the NRC issued Information Notice (IN) 92-51, "Misapplication and Inadequate Testing of Molded-Case Circuit Breakers (MCCBs)." This notice informed addressees about problems that can cause certain MCCBs to trip when starting their safety-related motor loads due to in-rush transient (asymmetrical) currents. This IN was later supplemented in April 1994 with more specific guidance concerning recommended industry test methods. The inspectors noted that the licensee's evaluation of IN 92-51 and its supplement, concluded that the issue did not affect Virgil C. Summer Nuclear Station and that no actions were necessary.

In February of 1999, during investigation and evaluation of a spurious trip of the "B" Control Room (CR) Emergency Filtering System Fan (XFN0030B-M), the licensee documented in CER 0-C-99-0084 that several (36) safety-related motors supplied by molded case circuit breakers were "susceptible," (i.e., calculated minimum trip to maximum locked rotor current ratio of 2.0 or less), to spurious tripping caused by asymmetrical in-rush currents. Of those 36 susceptible motor loads, nine of them were subsequently evaluated as "most susceptible," (i.e., calculated minimum trip to maximum locked rotor current ratio of 1.38 or less), to spurious tripping caused by asymmetrical in-rush currents. The ratio of 1.38 or less was arbitrarily chosen based upon the fact that the "B" CR Emergency Filtering System Fan motor had experienced the spurious trip with a ratio of 1.38. Several options were discussed including replacing the magnetic-only breakers with thermal-magnetic breakers that have a higher instantaneous trip value. After discussions with the Electrical Shop Supervision, the most cost effective solution was determined to be elimination of the lower half of the present breaker setting acceptance criteria. The setpoint tolerance was +/- 15%; however, for these selected breakers, the new tolerance was changed to -0% to +15% to correct the spurious tripping condition/susceptibility.

Enclosure

Though all four of the EDG room ventilation supply fans were identified during that evaluation as being “susceptible,” no corrective actions were taken to preclude any spurious trips due to asymmetrical in-rush currents at that time due to their calculated minimum trip to maximum locked rotor current ratio being 1.47. In June, 2004, the breaker for “A” EDG room ventilation supply fan (XFN0075A), was found tripped. Further investigation attributed the cause to asymmetrical in-rush current. As a result of this event, all four EDG room ventilation supply fans breaker setting acceptance criteria was adjusted to change the as-left tolerances from +/- 15% to -0% to +15%. On April 28, 2006, the breaker for “A” EDG room ventilation supply fan “B” (XFN0075B), was found tripped. Subsequent investigation attributed the cause to asymmetrical in-rush current. Post trip calibration results revealed that the “as-found” trip setting of the breaker was within the previously modified tolerance range of -0% to +15%. The inspectors determined that the licensee’s corrective actions to date to address the industry known issue with spurious tripping of magnetic only MCCBs due to asymmetrical in-rush currents have been ineffective. The licensee has entered this issue in its CAP for resolution.

Analysis. This finding is more than minor because it affected the mitigating systems cornerstone attribute of equipment performance (i.e., Emergency Diesel Generator) and adversely affected the cornerstone objective of ensuring the availability, reliability and capability of systems that respond to initiating events. On an emergency start of the EDGs, both ventilation cooling fans in each EDG room are designed to auto-start to provide room cooling. If either fan experienced a spurious trip due to the in-rush current phenomenon, the operators would be immediately alerted to the condition via fan trip alarms in the control room. The inspectors reviewed alarm response procedures and determined that adequate guidance and time existed for the operators to reset the fan motor breakers located in the EDG rooms and restart the fans prior to exceeding design basis room temperatures that might challenge the capability of the EDGs to perform their designed safety function. Thus, a SDP Phase 1 analysis characterized the finding as being of very low safety significance because it did not result in a loss of safety function of one or more trains of the EDGs and was not potentially risk-significant due to possible external events. The direct cause of this finding involved the cross-cutting area of Problem Identification and Resolution, in that, the identified corrective actions were not adequate to resolve the fans tripping due to asymmetrical in-rush current.

Enforcement. 10 CFR 50, Appendix B, Criterion XVI, “Corrective Action,” requires, in part, that measures be established to assure that conditions adverse to quality are promptly identified and corrected. In addition, for significant conditions adverse to quality, measures shall assure that the cause of the condition is determined and corrective actions be taken to preclude repetition. Contrary to this, the licensee failed to take adequate corrective actions and prevent repetition following the failure of CR Emergency Filtering System Fan “B” (XFN0030B-M) in February of 1999, CR Emergency Filtering System Fan “A” (XFN0030A-M) in August of 2000, and “A” EDG room ventilation supply fan “A” (XFN0075A) on June 9, 2004. As a result, a repetitive condition was discovered on April 28, 2006, with the “A” EDG room ventilation supply fan “B” (XFN0075B) tripping due to the same conditions identified for the “A” EDG fan in 2004. Because the finding is of very low safety significance and has been entered into

Enclosure

the licensee's CAP as CER 0-C-06-1449, this violation is being treated as a NCV, consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000395/2006003-01, Failure to Take Adequate and Timely Corrective Actions to Preclude Repetitive Spurious Tripping of Safety Related Molded Case Circuit Breakers.

.3 Semi-Annual Trend Review

a. Inspection Scope

As required by Inspection Procedure 71152, "Identification and Resolution of Problems," the inspectors performed a review of the licensee's corrective action program and associated documents to identify trends that could indicate the existence of a more significant safety issue. The review was focused on repetitive equipment issues, but also considered trends in human performance errors, the results of daily inspector corrective action item screening discussed in Section 4OA2.1 above, licensee trending efforts, and licensee human performance results. The review nominally considered the six-month period of January 2006 through June 2006. Documents reviewed included licensee monthly and quarterly corrective action trend reports, engineering system health reports, department self-assessment activities, and quality assurance audit reports.

b. Findings

No findings of significance were identified. The inspectors evaluated the licensee's trending methodology and observed that the licensee had performed a detailed review. The licensee routinely reviewed the cause codes, involved organizations, key words, and system links to identify potential trends in their corrective action program data. The inspectors compared the licensee's reviews with the results of the inspectors' daily screening and did not identify any discrepancies or potential trends in the data which the licensee had failed to identify.

4OA5 Other

.1 (Closed) Unresolved Item (URI) 05000395/2004009-02: Tornado Missile Vulnerabilities of Outdoor Components

As described in URI 05000395/2004009-02, NRC inspectors identified several outdoor components that were important for safe shutdown not protected from potential tornado missile damage. The licensee had not evaluated the tornado missile vulnerability of those outdoor components as apparently described in the FSAR. This URI was left open for further NRC review of the related licensing basis requirements.

Upon further review, the NRC determined that FSAR Section 3.5.1.4, describes the licensing basis used at the station for evaluating specific missile types generated by the design tornado. In addition, based on the equation described in the FSAR, the NRC determined that the licensee was required to consider the tornado missile vulnerability of both indoor and outdoor safe shutdown components. (The evaluation performed by the

Enclosure

licensee prior to the inspection only considered the tornado missile vulnerability of indoor safe shutdown components.) In addition, per the FSAR, this cumulative probability was to be less than 1 E-7 per year.

The licensee's failure to include the risk of tornado missile damage to unprotected outdoor components represented a finding and a violation of 10 CFR 50, Appendix B, Criterion III, Design Control. The inspector reviewed the licensee's corrective actions as documented in CER 0-C-04-3637 and CER 0-C-04-3778. On May 3, 2006, the inspector made a site visit and walked down the unprotected outdoor components. In addition, the inspector reviewed the licensee's preliminary calculation for the cumulative missile strike probability for all indoor and outdoor components and discussed the issue with licensee engineers. The inspector found that this revised cumulative missile strike probability, including the indoor and outdoor components, was substantially below the FSAR threshold of 1 E-7 per year. Because the consideration of outdoor components did not cause the overall missile strike probability for safe shutdown components to exceed the value specified in the FSAR, this finding was of minor significance. URI 05000395/2004009-02 is closed.

.2 (Closed) Licensee Event Report (LER) 50-395/2005-002-01: Mode 3 Entry with an Inoperable Emergency Feedwater Pump, Supplement 1

The inspectors reviewed the subject LER and CER 0-C-05-2300 to verify the accuracy of the LER and the appropriateness of the corrective actions. The supplement to this LER provide revision to the corrective actions following additional licensee management review and revision to the root cause report. No new findings of significance were identified. The regulatory significance of this issue was previously discussed in NRC Integrated Inspection Report 05000395/2005004.

.3 (Closed) Temporary Instruction (TI) 2515/165: Operational Readiness of Offsite Power (OSP) and Impact on Plant Risk

The inspectors reviewed licensee procedures and controls, and interviewed operations and maintenance personnel, to verify these documents contained specific attributes delineated in the TI to ensure the operational readiness of offsite power systems in accordance with plant Technical Specifications; the design requirements provided in 10 CFR 50, Appendix A, General Design Criterion 17, "Electric Power Systems," and the impact of maintenance on plant risk in accordance with 10 CFR 50.65(a)(4), "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." Documents reviewed are listed in the Attachment. Appropriate documentation of the results of this inspection was provided to NRC headquarters staff for further analysis, as required by the TI. This completes the Region II inspection TI requirements for the Virgil C. Summer Nuclear Station.

4OA6 Meetings, Including ExitExit Meeting Summary

The inspectors presented the inspection results to Mr. Thomas Gatlin and other members of the licensee staff on July 11, 2006. The inspectors confirmed that proprietary information was not provided or examined during the inspection.

## 4OA7 Licensee-Identified Violations

The following finding of very low safety significance (Green) was identified by the licensee and is a violation of NRC requirements which met the criteria of Section VI of the NRC Enforcement Policy, NUREG-1800, for being dispositioned as an NCV.

- TS 6.8.1.a requires, in part, that written procedures be established, implemented and maintained covering activities listed in Regulatory Guide 1.33, Rev. 2, Appendix A, February 1978, which includes procedures for conducting calibrations of equipment required by TS (Section 8.b). Surveillance Test Procedure STP-360.031, "Control Room Supply Air Atmospheric Radiation Monitor RMA0001 Calibration," Rev. 8, was written to accomplish TS required calibrations of control room isolation radiation monitor RM-A1. Step 7.6.4 of the procedure directed "B" Train CR ventilation system to be placed in "emergency" mode while testing of the "A" Train CR ventilation system. Contrary to the requirements of STP-360.031, on May 17, 2006, the Control Building operator secured the "B" Train CR ventilation system from emergency mode during "A" Train ventilation testing. The system was restored nineteen minutes later after the Shift Supervisor became aware that the system had been secured from the emergency mode. At the time of the event, RM-A1 was already considered inoperable and the licensee was maintaining the "B" Train CR ventilation system in emergency mode as part of the requirements of Action Statement 29 of TS 3.3.3.1. The licensee determined that during the nineteen minutes that the "B" CR ventilation was not in service, they were in violation of the requirements of TS 3.3.3.1. This finding is of very low safety significance because of the short duration that the system was not in its required configuration. This issue was entered into the licensee's CAP as CER 0-C-06-1648.

ATTACHMENT: SUPPLEMENTAL INFORMATION

Enclosure



## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### **Licensee**

J. Archie, Vice President, Nuclear Operations  
F. Bacon, Manager, Chemistry Services  
M. Browne, Manager, Quality Systems  
A. Cribb, Acting Supervisor, Nuclear Licensing  
M. Findlay, Manager, Nuclear Protection Services  
M. Fowlkes, General Manager, Engineering Services  
D. Gatlin, General Manager, Nuclear Plant Operations  
D. Lavigne, General Manager, Organizational Effectiveness Training  
G. Lippard, Manager, Operations  
G. Moffit, Manager, Nuclear Operations Training  
P. Mothena, Acting Manager, Health Physics and Safety Services  
J. Nesbitt, Manager, Materials and Procurement  
K. Nettles, General Manager, Nuclear Support Services  
R. Stokes, Manager, Design Engineering  
W. Stuart, Manager, Plant Support Engineering  
R. Sweet, Manager, Nuclear Licensing  
A. Torres, Manager, Planning / Scheduling and Project Management  
S. Zarandi, Manager, Maintenance Services

### **ITEMS OPENED, CLOSED, AND DISCUSSED**

#### **Opened**

None

#### **Opened and Closed**

05000395/2006003-01	NCV	Failure to Take Adequate and Timely Corrective Actions to Preclude Repetitive Spurious Tripping of Safety Related Molded Case Circuit Breakers (Section 4OA2.2)
---------------------	-----	---

#### **Closed**

05000395/2004009-02	URI	Tornado Missile Vulnerabilities of Outdoor Components (Section 4OA5.1)
---------------------	-----	--

05000395/2005002-01	LER	Mode 3 Entry with an Inoperable Emergency Feedwater Pump (Section 4OA5.2)
---------------------	-----	---

2515/165	TI	Operational Readiness of Offsite Power (OSP) and Impact on Plant Risk (Section 4OA5.3)
----------	----	--

#### **Discussed**

None

## LIST OF DOCUMENTS REVIEWED

### **Section 1R04: Equipment Alignment**

SOP-211, "Emergency Feedwater System"

SOP-306, "Emergency Diesel Generator"

SOP-307, "Diesel Generator Fuel Oil System"

SOP-117, "Service Water System"

Drawing D-302-221, Service Water Cooling

Drawing D-302-222, Service Water Cooling

Service Water System Design Basis Document

### **Section 1R07: Heat Sink Performance**

#### **Procedures**

ES-560.211, Service Water Heat Exchanger Performance, Rev. 8

PTP-213.002, Service Water System Heat Exchanger Data Collection, Rev. 1

### **Section 1R07A: Procedures and Completed Procedures (Testing Data)**

PMTS 0601936, Service Water HX Performance For 110% Run (Intercooler HX), 03/29/2006

Work Orders Associated With "B" EDG Intercooler HX

ES-560.211, Service Water System Heat Exchanger Performance, Rev. 8

PTP-213.002, Service Water System Heat Exchanger Data Collection, Rev. 1

Diesel Generator HX Performance Testing Trends

#### **Condition Evaluation Reports**

0-C-06-1091, Intercooler Heat Exchanger (XHE0017B-HE3) does not meet the Design Basis Limiting Conditions of ES-560.211 due to apparent fouling on the shell side.



**LIST OF ACRONYMS**

AB	Auxiliary Building
AC	Alternating Current
BAR	Bypass Authorization Request
BISI	Bypass Inoperable Status Indication
CAP	Corrective Action Program
CER	Condition Evaluation Report
CFR	Code of Federal Regulations
CR	Control Room
ECR	Engineering Change Request
EDG	Emergency Diesel Generator
EOP	Emergency Operating Procedure
EPP	Emergency Plan Procedure
ES	Engineering Services Procedure
FSAR	Final Safety Analysis Report
GTP	General Test Procedure
HVAC	Heating, Ventilation, and Air Conditioning
IB	Intermediate Building
IMC	Inspection Manual Chapter
IN	Information Notice
LER	Licensee Event Report
MCCB	Molded Case Circuit Breaker
MDEFW	Motor Driven Emergency Feedwater
MPFF	Maintenance Preventable Functional Failures
MR	Maintenance Rule
MWR	Maintenance Work Request
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OAP	Operations Administrative Procedure
OOS	Out-of-Service
PMT	Post-Maintenance Testing
RB	Reactor Building
RHR	Residual Heat Removal
ROP	Reactor Oversight Process
RTP	Rated Thermal Power
SAP	Station Administrative Procedure
SDP	Significance Determination Process
SOP	System Operating Procedure
SSC	Structures, Systems, or Components
STP	Surveillance Test Procedure
SW	Service Water
SWBP	Service Water Booster Pump
SWPH	Service Water Pumphouse
TDEFW	Turbine Driven Emergency Feedwater
TS	Technical Specification
URI	Unresolved Item